Three new species and a new genus of tripterygiid fishes (Blennioidei) from the Indo-West Pacific Ocean

by

WOUTER HOLLEMAN

Albany Museum, Grahamstown, South Africa

CONTENTS

ABSTRACT

A new species of *Helcogramma, H.fuscopinna*, which ranges across the Indo-West Pacific (excluding the Red Sea) from as far south as Durban to southern Japan, is described. Two new species of *Enneapterygius, E.clarkae* from the western Indian Ocean including the Red Sea, and *E. ventermaculus* from Zululand, Aden and Pakistan, are described. The possibility that *Enneapterygius* may not be monophyletic is discussed. *Gillias capensis* (Gilchrist & Thompson) is assigned to a new genus, *Cremnochorites*, and the species is redescribed. Reference is made to certain osteological features of the family, particularly the presence of a free pterygiophore between the second and third dorsal fins and the occurrence of a septal bone in certain tripterygiid genera.

INTRODUCTION

Recent collecting of inshore fishes from the Zululand coast revealed the presence of several undescribed species in the family Tripterydiidae. These collections formed the basis for a revision of the South African species by Holleman (1978).

With the exception of Clark's (1979) revision of the Red Sea species and Holleman's (1978) unpublished dissertation of the South African taxa, little is known of the taxonomy of the family. Confusion abounds, particularly in the assignation of nominal Indo-Pacific species and genera.

Pending revisions of the two largest genera, *Helcogramma* and *Enneapterygius* which are currently in progress (by Hanson and Holleman respectively), the new species are here described without providing keys to the species of each genus. Diagnoses are provided for the genera, and the species are distinguished from apparently closely related species. Comments are also made on the status of *Enneapterygius* since an investigation of the osteology of this genus (Holleman, 1978) casts some doubt on its monophyly.

Gillias capensis (Gilchrist & Thompson) was placed in *Gillias* Everman & Marsh, 1899 by Barnard (1927). Rosenblatt (1960) synonymised *Gillias* with *Enneanectes* but did not refer any of the South African or Australian species ascribed to *Gillias* to other genera. *Gillias capensis* is not referable to *Enneanectes*. The latter genus is reputedly endemic to the eastern Pacific Ocean and Caribbean (Rosenblatt, 1960). *Enneanectes* lacks the characteristic scalation of *G. capensis*. Clark (1979) suggests that *G. capensis* may be referable to *Norfolkia* Fowler. This is not the case, however, as the two genera differ considerably in osteology and scalation. A new genus, *Cremnochorites*, is thus proposed for *G. capensis*. *Cremnochorites* appears to be monotypic and endemic to the southern coast of South Africa.

METHODS

The methods of taking measurements follow those outlined by Hubbs & Lagler (1958). All fin elements were counted following Rosenblatt (1960) and Springer (1968). The last dorsal and anal fin rays are almost without exception divided to the base and are counted as a single element. The caudal fin of tripterygiids, with the exception of the highly specialized *Notoclinus* which has ten principal rays, invariably has seven dorsal and six ventral segmented principal rays, with the upper- and lowermost rays unbranched and the remainder bifurcate. There is also a variable number of dorsal and ventral unsegmented procurrent rays.

All species here considered have two undivided segmented rays and one short hidden spine in each pelvic fin. The rays are united by a membrane for part of their length. The inner ray is always the longest.

The following measurements and counts are given in Tables 1–3: standard length (SL); head length; horizontal eye diameter; snout length; upper jaw length; snout angle (measured as shown in Fig. 1—the "angle of head profile" of Zander & Heymer (1979)); counts for all fins except pelvic fins; number of caudal and precaudal vertebrae; lateral line counts; transverse scales, and total lateral scales.

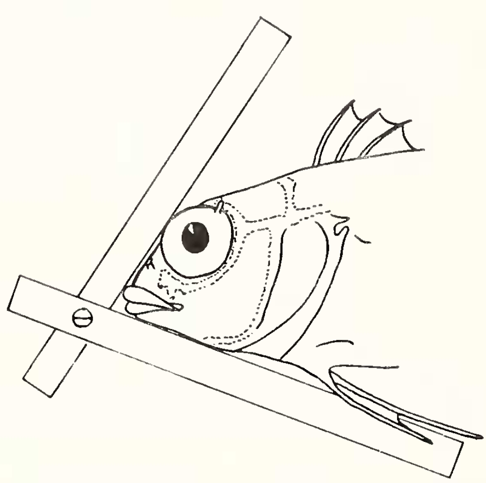

FIG. 1. Diagram to show how "snout angle" is measured.

The numbers of caudal and precaudal vertebrae were determined from cleared and stained specimens and from radiographs. The choice as to which vertebra to count as the first caudal vertebra poses a problem. Springer (1968) considered the first vertebra bearing a well-developed haemal spine as the first caudal vertebra for Blenniidae, where the first proximal anal pterygiophore is associated with the first haemal spine. Certain authors consider the first vertebra with closed haemal arch as the first caudal vertebra. The first "well-developed" haemal spine of most tripterygiids is distally forked (Fig. 2) and the subsequent centrum has a conventional haemal spine (Fig. 2). The first two proximal anal pterygiophores fall between the forked haemal spine and the first proper haemal spine and the third pterygiophore is associated with the latter. The first closed haemal arch is usually coincident with the forked haemal spine but closure may occur in one or two preceding vertebrae. As closure of the haemal arch is extremely difficult to determine from radiographs, it is expedient to consider the centrum with the forked haemal spine as the first caudal vertebra. This is most easily determined as the vertebra with a haemal spine immediately anterior to or in contact with the first anal pterygiophore. This criterion for the first caudal vertebra is thus adopted here.

Clark (1979) does not state which vertebra she considers the first caudal vertebra. Vertebral counts given by Clark and herein are therefore not necessarily comparable.

Where the lateral line is divided into two portions, one of pored and one of notched scales, these are referred to as "anterior" and "posterior series". Counts of total lateral scales were made from the first scale in the pectoral fin axil to the last scale on the caudal peduncle, not counting scales on the caudal fin. Transverse scale counts were taken along a diagonal from the first spine of the second dorsal fin to the base of the anal fin and the count is given as *x/y* where *x* is the number of scales above the lateral line and *y* the number of scales below the lateral line.

Osteological observations were made on specimens cleared and stained by the trypsin-alizarin technique of Taylor (1967).

Abbreviations— BMNH = British Museum of Natural History; BPBM = Bernice P. Bishop Museum; LACM = Los Angeles County Museum of Natural History; RUSI = J. L. B. Smith Institute of Ichthyology; SAM = South African Museum; USNM = United States National Museum of Natural History.

TABLE 1

Frequency distribution of number of vertebrae.

	Precaudal			Caudal vertebrae						
Species	9	10	11	22	23	24	25	26	27	28
Helcogramma fuscopinna		12						3	8	1
Enneapterygius clarkae		10		2	8					
E. ventemaculus		12				1	3	8		
Cremnochorites capense		23							13	10

TABLE 2

Frequency distribution of meristic data.

	First Dorsal		Second Dorsal					Third Dorsal				Anal										
	III	IV	XI	XII	XIII	XIV	XV	8	9	10	11	I	II	15	16	17	18	19	20	21	22
Helcogramma fuscopinna	75				4	68	3			14	61	74						2	16	56	
Enneapterygius clarkae	22		11	11				3	18	1		22			19	3					
E. ventemaculus	60		4	48	8			1	13	44	2	60				1	15	42	2		
Cremnochorites capense		26				23	3			2	24		25							21	4

	Lateral line—Anterior Series																		—Posterior Series									
	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	16	17	18	19	20	21	22	23	24	25
Helcogramma fuscopinna												4	7	17	17	7	2	1										
Enneapterygius clarkae	6	12	1																				1	3	10	2		
E. ventemaculus			3	13	27	8																		2	9	16	10	3
Cremnochorites capense											5	5	9	3					1	5	2	2	2	1	2		1	

TABLE 3

Summary of Morphometric Data. (Mean values given in parenthesis.)

	Helcogramma fuscopinna 75 specimens 19,6–42,3 mm SL	*Enneapterygius clarkae* 24 specimens 15,5–25,2 mm SL	*E. ventermaculus* 56 specimens 17,8–31,8 mm SL	*Cremnochorites capense* 26 specimens 18,5–80,8 mm SL
Head in SL	3,2–3,7(3,4)	3,3–3,9(3,5)	3,5–4,0(3,7)	3,2–3,7(3,5)
Eye in Head	2,6–3,1(2,9)	2,8–3,6(3,1)	3,0–3,7(3,3)	3,0–3,6(3,3)
Upper Jaw in Head	2,0–2,4(2,1)	2,5–4,0(2,8)	2,8–3,3(3,1)	2,0–2,4(2,3)
Snout in Head	2,9–4,2(3,5)	3,7–4,9(4,2)	3,0–3,4(3,5)	3,6–4,2(4,0)
Snout Angle	68°–73°(70°)	71°–76°(73°)	76°–78°(78°)	71°–75°(74°)

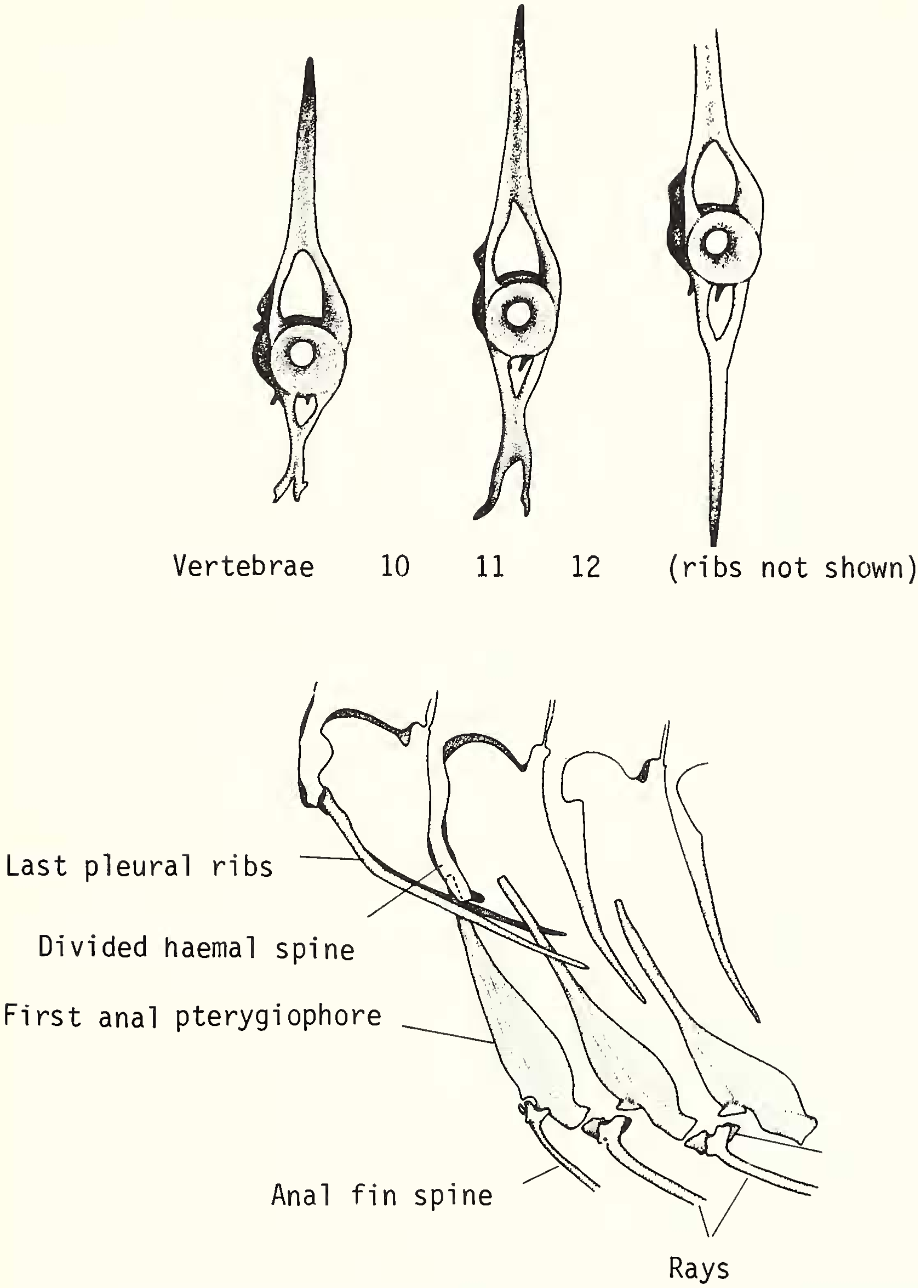

FIG. 2. Last precaudal and first two caudal vertebrae of *Enneapterygius clarkae* with associated anal pterygiophores.

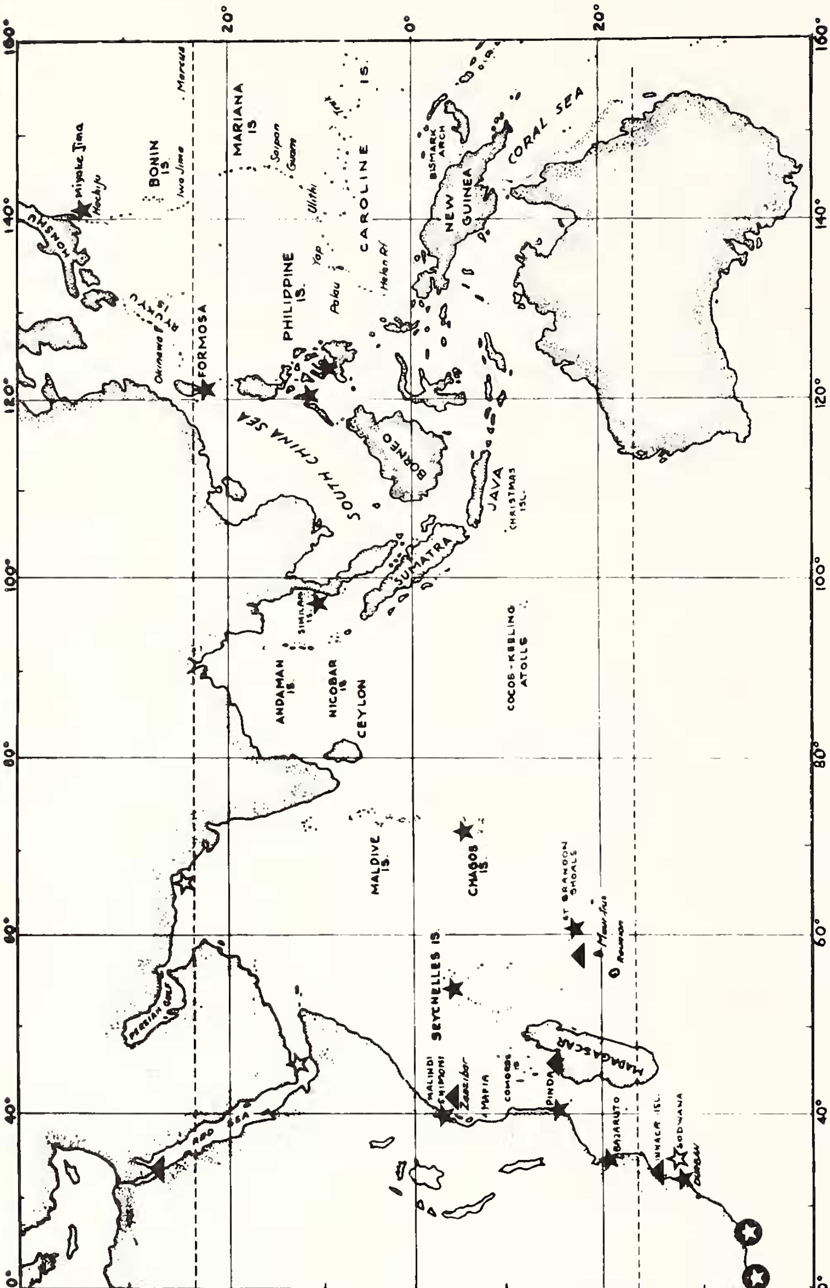

FIG. 3. Distribution of tripterygiid fishes based on examined material. ★ *Helcogramma fuscopinna*; ☆ *Enneapterygius ventermaculus*; ▲ *E. clarkae*; ✪ *Cremnochorites capensis*

DESCRIPTION OF SPECIES

Genus *Helcogramma* McCulloch & Waite

Helcogramma McCulloch & Waite 1918: 51 (Type-species, *Helcogramma decurrens* McCulloch & Waite, 1918, by original designation).

Diagnosis

First dorsal fin with three spines; anal fin with one spine. Lateral-line a continuous series of pored scales curving down behind pectoral fin base and continuing midlaterally to below second or third dorsal fin or onto caudal peduncle. Head naked, nape of some species scaled; body, except abdomen and pectoral fin bases, with ctenoid scales. Scalation at base of first and second dorsal fins reduced in some species. Two or three rows of conical teeth on vomer and anterior ends of palatines.

Description (Characters in diagnosis not repeated)

Dorsal fins III+X–XVI+6–12. Anal fin I+14–21. Pectoral fin rays 15–17, lowermost 6–7 simple and thickened, uppermost 1–5 simple, remainder bifurcate. Caudal fin 8–10 dorsal, 7–10 ventral procurrent rays. Small, simple orbital and anterior nasal tentacles usually present. Mandibular sensory canals confluent, opening as single or double pore just posterior to lower jaw symphysis. Lateral-line a continuous series of 17–37 pored scales. Jaws with slightly recurved, fixed teeth in bands in front, decreasing posteriorly to a single row; teeth in outer rows enlarged; 2–3 rows of conical teeth on vomer and anterior ends of palatines. Septal bone (see under General Discussion) present; cephalic lateralis canals not covered by bone; hypural 5 small and unossified, one or two epurals.

Discussion

Helcogramma is confined to the Indo-Pacific Oceans as far east as Hawaii. There appear to be in excess of 17 species which can be ascribed to the genus. Clark (1979) states that about 10 species are known from the Indo-Pacific and Red Sea. Most of Fowler's (1964; 1958) species, which he placed first in *Enneapterygius* and then *Tripterygion*, appear to belong in *Helcogramma.*

Helcogramma fuscopinna. **sp. nov.** Fig. 4.

Diagnosis

Second dorsal fin usually with 14 rays; anal fin usually with 21 rays. First two dorsal fins and anal fin conspicuously dark to black; a distinct blue-white line finely stippled with melanophores extends from upper lip, below eye, to posterior margin of preopercle.

Description (characters for holotype in parenthesis).

Dorsal fins III+XIII–XV+10–11 (III+XIV+11), usually III+XIV+11. First dorsal fin slightly lower than, or equal to, second dorsal, slightly higher in males than in females; anal fin I+19–21(I+21), usually 21; pectoral fin 16–17 upper 3–4 simple, lowermost 7 simple and thickened, remainder bifurcate; caudal fin 9–10,7+6,9–10; pelvic fin rays united by membrane for half to third of their length. Lateral-line 22–33 (25), usually 24–25, pored scales ending below front of third dorsal fin; transverse scales 6/8; lateral scales 38–41 (40), usually 39. Precaudal vertebrae 10; caudal 26–28, usually 27. Head 3,2–3,7 in SL; eye 2,6–3,4, upper jaw 2,0–2,4, snout 2,9–4,2 in head. Snout angle 68°–73°. Body scales do not extend to bases of first and second dorsal fins.

Colour

Freshly caught adult males with orange-pink body and conspicuously dusky anal and first two dorsal fins. Scales generally with row of small melanophores along posterior margin. Small dusky rosettes scattered over body, generally more densely below midline. Darkly pigmented specimens have a row of five or six grey-white blotches stippled with small melanophores above and below midline. These may produce faint vertical banding. There may also be two pairs of white blotches on either side of dorsum at posterior ends of second and third dorsal fins. Distinct blue-white line stippled with very fine melanophores extends from upper lip, below eye to posterior edge of preopercle. This line may be continued as two or three spots on opercle and upper pectoral fin base. Head below blue-white line, throat and chest heavily stippled with dusky to black spots and rosettes; head above line pale. Orbital tentacle black; nasal tentacle unpigmented. Nape and interorbital area pinkish. First two dorsal fins heavily stippled; stippling on third dorsal lighter, occurring mainly on the fin margin. Anal fin darkly pigmented; caudal fin slightly darker than third dorsal but not as dark as second. Melanophores decrease in size from fin base to margin and grade from dark brown at base to black at margin. Lower half of pectoral fins darker than upper, with oblique white blotch on middle of base; melanophores on lower part of base tend to form a large dark blotch. Pelvic fins finely stippled, darker basally than distally.

Juveniles and small females are virtually immaculate; larger females have lower half of body lightly dusted with small melanophores, dusky margins to anal and first two dorsal fins and stippling on lower part of pectoral fin base, mid-opercle, cheek, snout and nape. Orbital tentacle dark. Sometimes white blotches at posterior ends of second and third dorsal fins.

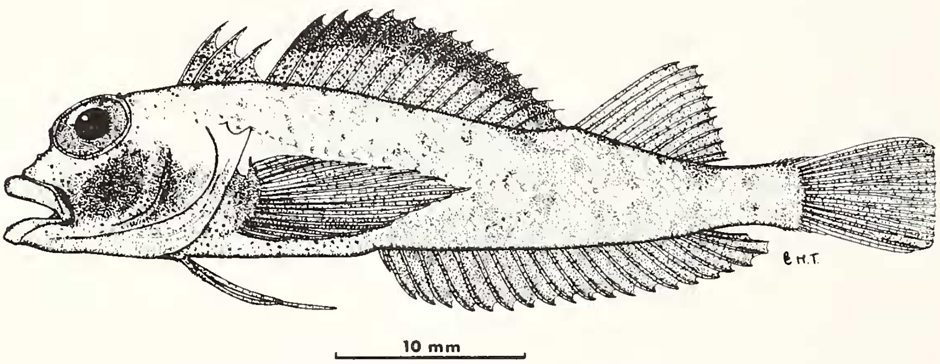

FIG. 4. *Helcogramma fuscopinna* sp.n. RUSI 954. Holotype, male 37,6 mm SL.

Material examined

Holotype—RUSI 954 (out of former RUSI 77–18) male, 37,6 mm SL; reef offshore Sodwana Bay (27° 31′S, 32° 41′E), Zululand, South Africa: depth 10 m; June, 1977; M. S. Christensen, W. Holleman, W. Devos; field number MSC 77–18.

Paratypes—RUSI 955 (2, 36,5 & 40,0 mm SL), taken with holotype. RUSI 956 (6, 32,0–41,7 mm SL), Bazaruto Isl., Mozambique; Sept., 1954; J. L. B. & M. M. Smith.

RUSI 489 (15, 26,0–36,9 mm SL), gully with vertical sides offshore Sodwana Bay; depth 10 m; 28 July, 1976; R. Winterbottom, M. S. Christensen, A. E. Louw (field number RW 76–21).

RUSI 190 (28, 22,0–43,0 mm SL), as preceeding—remainder of former RUSI 76–8.

BPBM 21164 (5, 31,5–41,3 mm SL), reef 1 km off north of Sodwana Bay; depth 10–12 m; 21 June, 1977; J. E. Randall, M. S. Christensen.

BMNH 1978.5.30. 1–2 (2, 31,4 & 40,5 mm SL) patch reef, 1 km offshore Sodwana Bay; depth 10 m; July, 1976; R. Winterbottom, M. S. Christensen; A. E. Louw (both out of former RUSI 76–8).

USNM 227738 (4, 28,5–39,9 mm SL); southwest shore just off Ch'uan-fan-shih, Taiwan (21° 55′ 48″N, 120° 48′ 48″E); depth 8–9 m; 3 May, 1968; V. G. Springer *et al.;* field number VGS 68–14.

USNM 227740 (33, 28,9–39,1 mm SL); rocky reef with some live coral, course sand bottom off northern tip of St Brandon's Shoals (16° 25′S, 59° 36′E); depth 6–11 m; 6 April, 1976; V. G. Springer *et al.;* field number VGS 76–10.

USNM 227741 (33, 13,7–36,3 mm SL); dead coral channels, about half mile SW of tip of North Island, St Brandon's Shoals (10° 9′S, 56° 35′E); depth 0–8 m; 17 April, 1976; V. G. Springer *et al.;* field number VGS 76–24.

USNM 227742 (3, 35,0–36,4 mm SL); west side Apo Island about ⅓ km north of South end, Philippine Islands (09° 04′ 25″N, 123° 16′ 05″E); depth 0–6 m; 6 June, 1978; V. G. Springer *et al.;* field number SP–78–34.

USNM 227743 (3, 33,2–40,3 mm SL); blind surge channel with many small caves, 100 yards off west side of Raphael, St Brandon's Shoals (16° 26′S, 59° 36′E); depth 0–8 m, 2 April, 1976; V. G. Springer *et al.;* field number VGS 76–6.

USNM 227744 (2, 31,7 & 39,3 mm SL); northwest side (Cuyo Island) Putic Island, Palawan, Philippine Islands (10° 55′ 05″N, 121° 02′ 03″E); depth 0–4,6 m; 22 May, 1978; V. G. Springer *et al.;* field number SP–78–18.

USNM 227746 (19, 14,4–30,7 mm SL); about 1 km south of west of north end of North Island, Agalega Island, St Brandon's Shoals; depth 6–8 m; 19 April, 1976; V. G. Springer *et al.;* field number VGS 76–29.

ROM 38782 (4, 27,3–32,8 mm SL), patch reef, inshore off Isle Fouguet, Peros Banhos, Chagos Archipelago (05° 26′ 40″S, 71° 41′ 02″E); depth 0,5–4 m; 21 February, 1979; R. Winterbottom *et al.;* field number WE 79–33.

ROM 38783 (1, 21,2 mm SL), steep drop off with mixed coral and sand, on lagoon side of Isle Mapua, Peros Banhos, Chagos Archipelago (05° 26′ 44″S, 71° 47′ 42″E); depth 3–7 m; 6 March, 1979; R. Winterbottom *et al.;* field number WE 79–55.

ROM 38784 (2, 30,9 & 23,6 mm SL), reef off Isle Anglaise, Peros Banhos, Chagos Archipelago (05° 24′ 40″S, 71° 46′ 12″E); depth 5–7 m; 8 February, 1979; R. Winterbottom & A. Emery; field number WE 79–10.

ROM 38785 (1, 26,8 mm SL), spur and groove formation, reef top on ocean side of SW tip of Isle Boddam, Salomons, Chagos Archipelago (05° 21′ 05″S, 72° 12′ 12″E); depth 0–3 m; 18 March, 1979; A. Emery *et al.*; field number WE 79–78.

WAM P26507-016 (2, 32 & 35 mm SL), Ko Similan, Similan Islands (8° 40′N, 97° 38′E); depth 3 m; 13 February, 1979; G. Allen and R. C. Steene.

USNM 227747 (91, 24, 4–38, 4 mm SL), face of channels of reef along SE side of Grande Passe, St Brandon's Shoals (16° 28′ S, 59° 40′E); depth 0–3 m; 5 April, 1976; V. G. Springer *et al.*; field number VGS 76–9.

USNM 227739 (1, 43,0 mm SL), bay with rock and coral, SE of K'enting, SE Taiwan; depth 0–3 m; 22 April, 1968; V. G. Springer *et al.*; field number VGS 68–1.

USNM 227745 (9, 29,8–40,8 mm SL), SW shore just off Ch'uan-fan-shih, Taiwan; depth 5–7 m; 28 April, 1968; V. G. Springer *et al.*; field number VGS 68–9.

Comparisons

There are six other species of *Helcogramma* described from the Red Sea, Indonesia and the Indian Ocean: *H. ellioti* (Herre, 1944), *H. indicus* Talwar & Sen (1971), *H. obtusirostre* (Klunzinger, 1871), *H. shinglensis* Lal Mohan (1971), *H. steinitzi* Clark (1979), *H. trigloides*

(Bleeker, 1858). Salient comparative features of these six species and *H. fuscopinna* are given in Table 4.

Herre (1944) provided a detailed description of the colour of *H. ellioti*. In males the head and trunk are brilliant blue ventrally (other species except *H. trigloides*, are dark brown to black); anal fin brilliant blue, caudal and dorsal fins lighter blue, and pectoral fin base with a bright blue ocellus outlined in golden red. This essentially agrees with the colour pattern of *H. trigloides* as described by Day (1876) from illustrations by Elliot. Bleeker (1858) gives an anal fin count of 10 (rays?) for *trigloides* whereas Day recorded 18–20 and de Beaufort & Chapman (1951) 19 rays. Talwar & Sen (1971) intimate that the species described by Day as *trigloides* was *indicus*. These authors do not give a source for their data for *trigloides*. The distinctive colour pattern of *trigloides* and *ellioti* does, however, distinguish them from other species.

H. fuscopinna is the only species with a norm of 14 spines in the second dorsal fin. It appears to be similar in colour pattern to *H. steinitzi* but lacks the scaled nape. It can also be clearly distinguished from *H. obtusirostre* by colouration (particularly the distinctive stipple line below the eye), relative eye size (the eye of *H. fuscopinna* is relatively larger than that of *H. obtusirostre*—Fig. 5) and snout angle (Table 1). There appears to be little to distinguish *H. shinglensis* from *H. obtusirostre*. Lal Mohan's (1971) description of *H. shinglensis* is based on only three specimens. This species is very similar in meristic data and colour pattern to South African *H. obtusirostre* and it is possible that *H. shinglensis* is referable to *H. obtusirostre*. Pending revision of the genus no further comments can be made on the status of the other species.

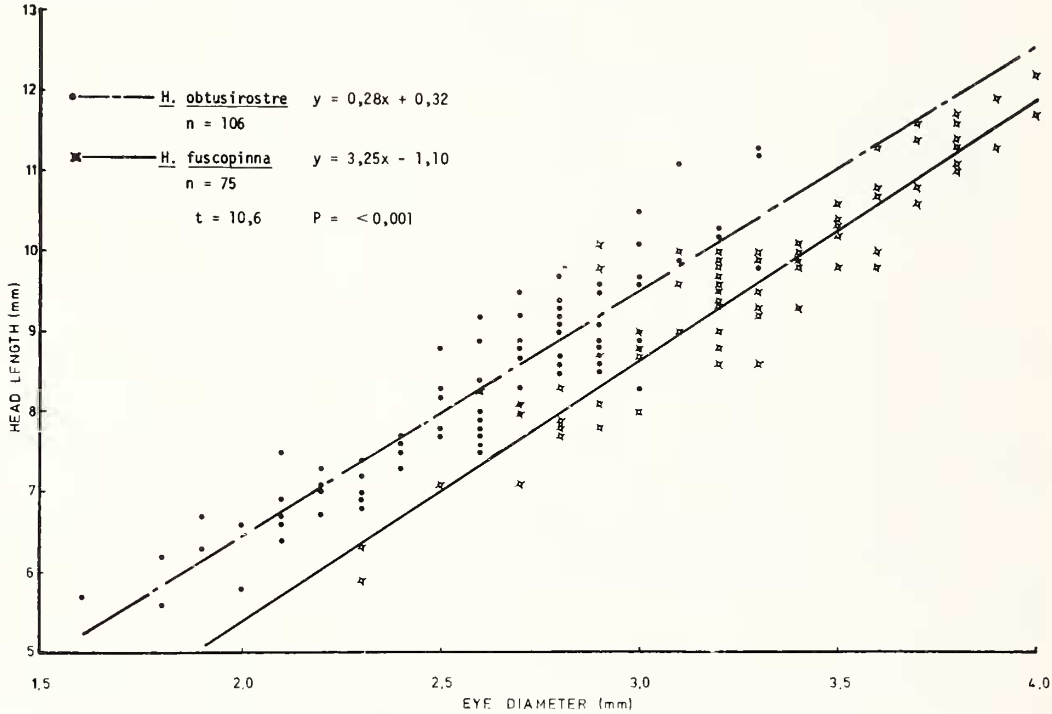

FIG. 5. Comparison of relative eye diameter of *H. obtusirostre* and *H. fuscopinna*.

Table 4.

Comparative features of seven species of *Helcogramma* from the western and central Indian Ocean.

	H. ellioti	*H. fuscopinna* 75 specimens	*H. indicus* 4 specimens	*H. obtusirostre* 106 specimens	*H. steinitzi* 88 specimens	*H. shinglensis* 4 specimens	*H. trigloides* (from Bleeker)	(from de Beaufort & Chapman)
Second dorsal fin spines	13	13–15	13	12–14	12–14	12,13	13	13
(usual number)		(14)		(13)	(13)			
Third dorsal fin rays	8–10*	10–11	9–10	9–11	10–12	9	10	10
(usual number)		(11)		(10)	(11)			
Anal fin rays	16–19*	19–21	17	17–20	29–21	20	10	19
(usual number)	(18)	(20–21)		(18–19	(20)			
Lateral line scales	34–35		33–34	19–29	21–27	20–22	50?	50
(usual number)		22–23	(34)	(22–24)	(25)			
Head in SL	2,9–3,2	3,2–3,7	3,0–3,3	3,2–4,1	3,1–3,5	3,0–3,8	4	
(mean)		(3,4)	(3,3)	(3,6)				
Eye in head)	3,3–3,4	2,6–3,1	3,2–3,4	2,8–3,6		2,7–3,0	2,5	2,8
(mean)		(2,9)	(3,3)	(3,2)				
Snout angle	"nearly*	68–73°		70–80°				
(mean)	vertical"	(70°)		(77°)				
Scalation: (a) nape	naked	naked	naked	naked	scaled	naked	naked	
(b) base of D_1 & D_2		naked	–	naked	scaled	naked?	–	

Data for *H. ellioti* from Herre (1944) and Lal Mohan (1971). (The figures with an asterisk taken from Herre, remainder from Lal Mohan. Lal Mohan gives dorsal fins III+XIII+II, anal fin I,20 in his key which disagrees with the original description).

Data for *H. steinitzi* from Clark (1979), for *H. indicus* from Talwar & Sen (1971), and for *H. trigloides* from Bleeker (1858) and de Beaufort & Chapman (1951).

Etymology

The name is derived from the combination of the Latin *fuscus*, dark coloured, and *pinna*, fin, referring to the dark dorsal and anal fins. It is to be treated as a noun in apposition.

Distribution and variation

Helcogramma fuscopinna appears to be a remarkably widely distributed species (Fig. 3). The only other tripterygiid which is apparently as nearly widely distributed is *H. obtusirostre* which has been recorded along the east coast of Africa from the Red Sea to the Transkei (Klunzinger, 1871; Clark *et al.*, 1968; collected by J. L. B. & M. M. Smith in East Africa during the 1950's; collected by the author in Zululand and on Natal Coast in 1976, 1977; collected by R. Winterbottom in Transkei in 1975). *H. fuscopinna* is not represented in recent collections from Christmas Island (collection of G. R. Allen and R. G. Steene, 1978) and the Cocos-Keeling Islands (collection of W. Smith-Vaniz *et al.*, 1974). It is also not one of the many tripterygiids described by Fowler (1946) from the Ryu Kyu Islands. A few large specimens were, however, collected by Hanson in southern Japan in 1978.

The specimens from Taiwan and Japan are considerably more heavily pigmented than those from the Indian Ocean. Five male specimens collected by Springer in the Philippine Islands also differ from the Indian Ocean specimens. Three of these (from Apo Islands) are very darkly pigmented, like those from Taiwan and Japan, and two (from Putic Island, Palawan Province) are considerably lighter. The three from Apo Island also have an unusually long first dorsal fin spine—in two specimens it is twice the length of the first spine of the second dorsal fin. Usually the difference in length is only about one third. The same three specimens also have a sharper snout (58°–64° versus 68°–73°). All five specimens have lower lateral-line counts, namely 20–23 (usually 24–25 in *H. fuscopinna*). In contrast the specimens from Taiwan have higher lateral-line counts, namely 26–33, except one with a count of 23. Comparable data are not available for the specimens from Japan. In all other respects the specimens from the Philippines conform to the description of the species and, until further material is available, are referred to *H. fuscopinna*.

Genus *Enneapterygius* Rüppell

Enneapterygius Rüppell 1835: 2 (Type species *Enneapterygius pusillus* Rüppell, 1835, by original designation).

Diagnosis

First dorsal fin with three spines; anal fin with one spine. Lateral-line divided into an anterior series of pored scales which ends below the second dorsal fin and a posterior series of notched scales from ½ to 2 scales below end of anterior series to base of caudal fin. Small, simple orbital and anterior nasal tentacles present. Head and nape naked; body with ctenoid scales, except abdomen and pectoral fin bases which are usually naked but with cycloid scales in some species. Vomer with 1–3 rows of conical teeth, palatines edentate.

Description (Characters in diagnosis not repeated).

Dorsal fins III+XI−XIV+8−11. Anal fin I+17−22. Pectoral fin 13−16, lowermost 6−7 simple and thickened, uppermost 1–4 undivided, remainder bifurcate. Caudal fin with 7–8 dorsal, 6–7 ventral procurrent rays. Lateral-line anterior series of 9–15 pored scales ending below second dorsal fin, posterior series of 21–28 notched scales from ½ to 2 scale rows below end of anterior series to base of caudal fin. Mandibular sensory canals confluent, opening as single pore just posterior to lower jaw symphysis. Supratemporal sensory canal "U"-shaped, curving around base of dorsal fin, or crescentic (Fig. 13). Jaws with slightly recurved conical teeth in bands in front, decreasing to single rows at sides of jaws; teeth in outer rows enlarged; septal bone present; cephalic lateralis canals not covered by bone; ascending and articular processes of premaxilla partly or completely fused; hypural 5 present or absent; single epural; free pterygiophore between second and third dorsal fins ossified or unossified (see General Discussion).

Remarks

The monophyly of the genus as described above is in doubt. The disparity in the form of the supratemporal sensory canal and associated structures, the ossification or non-ossification of a free pterygiophore between the second and third dorsal fins, the degree of fusion between the articular and ascending processes of the premaxilla and the presence or absence of hypural 5 suggests that the genus might potentially be divided into two. Pending a revision of the genus currently in progress, all the species below are referred to *Enneapterygius*.

Enneapterygius clarkae **sp. nov**. Fig. 6

Enneapterygius n. sp. 2 Clark, 1979: 104.

Diagnosis

Abdomen scaled; single row of thin cycloid scales on pectoral fin base parallel to margin of branchiostegal membrane. Body with four conspicuous vertical dark bars which divide ventrally and continue onto anal fin. Two less conspicuous bars under pectoral fin.

Description

(Except for colour pattern, characters in diagnosis not repeated).

Dorsal fins III+XI–XII+8–10, usually III+XII+9; anal fin I+16–17, usually 16; pectoral fin 14–15, usually 15, with uppermost 1–3 undivided, lowermost 7 undivided and thickened, remainder bifurcate; caudal fin 6–8,7+6,5–6. Pelvic fin rays united by membrane for less than quarter of their length. Lateral-line anterior series 11–12, usually 12, pored scales, posterior series 20–22, usually 22, notched scales from one scale below end of anterior series, overlapping by 2–3 scales, to base of caudal fin; transverse scales 3/6; longitudinal scales 29–30. Vertebrae, 10 precaudal and 22–23 caudal. Head 3,3–3,6 in SL; eye 3,0–3,3, upper jaw 2,5–4,0, snout 3,8–4,8 in head; snout angle 71°–73°. Supratemporal canal crescent shaped, free pterygiophore between second and third dorsal fins present. Orbital tentacle of same length as nasal tentacle, about three times as wide, with serrated margin. Longest pectoral fin ray reaches first ray of third dorsal fin.

Colour

No live or freshly dead specimens have been seen. Side of body marked with four conspicuous vertical dark bands, usually divided ventrally and continuing on to anal fin as 5–7 oblique bars. First band on body from middle of second dorsal fin, second from junction of second and third dorsal fins, third from posterior half of third dorsal fin and fourth on caudal peduncle. Last bar may be considerably darker than the others, particularly ventrally. Also one or two less distinct dusky vertical bands on body under pectoral fin. Black pre-anal mark present. Anterior half to two thirds of body and head dusted with melanophores. Abdomen unpigmented in females. Lower portion of the head and base of the pectoral fin with irregular bars. Pelvic fins unpigmented. First dorsal fin dusky, darker in males than females, with partial black margin in males. Faint, irregular dusky bars on third dorsal fin, lower half of pectoral fins and base of caudal fin.

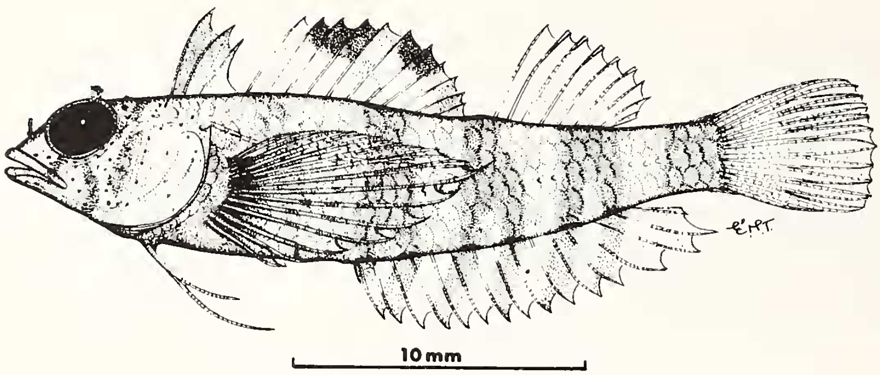

FIG. 6. *Enneapterygius clarkae* sp.n. RUSI 14175. Holotype, male, 23,5 mm SL.

Material examined

Holotype—RUSI 14175, male, 23,6 mm SL; coral reef off Barreira Vermelha, Inhaca Island, Mozambique; 5 December, 1970; T. H. Fraser; field number THF–SA–14.

Paratypes—RUSI 14174 (4, 18,9–24,0 mm SL); taken with holotype.

RUSI 14176 (1, 21,9 mm SL); reef with coral, Sodwana Bay, Zululand, South Africa; depth 15 m; 25 July, 1976; R. Winterbottom *et al.*; field number RW 76–15.

RUSI 7939 (2, 18,5 & 21,6 mm SL); Shimoni, Kenya; November, 1952; J. L. B. & M. M. Smith.

RUSI 14177 (3, 11,3–24,9 mm SL); rock arch with coral and sponges over sand, Sodwana Bay, Zululand, South Africa; depth 13 m; 24 July, 1976; R. Winterbottom *et al.*, field number RW 76–14.

RUSI 7938 (1, 20,5 mm SL); reef with coral, sponges, Sodwana Bay, Zululand; depth 14–17 m; 18 June, 1977; M. S. Christensen *et al.*, field number MSC 77–20.

RUSI 9842 (2, 17,9 & 23,4 mm SL); reef with coral and sponges, Sodwana Bay, Zululand; depth 8–10 m; 19 May, 1979; P. C. Heemstra *et al.*, field number PCH 79–23.

RUSI 14629 (4, 17,4–25,2 mm SL); Malindi Marine Reserve, Malindi, Kenya; April, 1978; P. Wirtz.

LACM 31617–27 (1, 24,5 mm SL); Manda Island, Kenya; 27 November, 1970; P. Saw.

USNM 231380 (1, 20,4 mm SL); reef station, Chesterfield Island (16° 21′S, 43° 59′E); depth 5 m; 16 October, 1964; Anton Bruun Cruise No. 8, Station 408F, International Indian Ocean Expedition; field number LK 64–66.

USNM 231378 (1, 23,1 mm SL); fossil coral rock patch with young corals, blind surge channel about 100 yards off Raphael on West side, St Brandon's Shoals (16° 26′S, 59° 36′E); depth 0–8 m; 2 April, 1976; V. G. Springer *et al.*; field number VGS 76–6.

USNM 231381 (1, 17,0 mm SL); coral reef off northwest shore, Albatross Island, St Brandon's Shoals (ca 16° 15′S, 59° 35′E); depth 0–18 m; 14 April 1976; V. G. Springer *et al.*; field number VGS 76–22.

USNM 231379 (1, 23,4 mm SL); Red Sea (27° 16′ 46″N, 33° 46′ 25″E); depth 0–3 m; International Indian Ocean Expedition; 1 January 1965; L. Kornicker & H. A. Feldmann; field number HA 29.

USNM 231382 (3, 13,5–21,7 mm SL); rock reef with live coral, channels, course sand bottom, off northern tip of St Brandon's Shoals (16° 25'S, 59° 36'E); depth 6–10 m; 6 April 1976; V. G. Springer *et al.*; field number VGS 76–10.

The larger two specimens of RUSI 14177 were cleared and stained.

Discussion and comparisons

Clark (1979) described five specimens of a species from the Red Sea which most probably is *E. clarkae*. The specimens were lost prior to the publication of the description and the species was consequently not named.

Clark was unsure whether these five specimens, described by her as *Enneapterygius* n.sp.2, represented a new species or were merely large adults of *E. destai* Clark, 1979. The South African specimens essentially agree with the description of Clark's n.sp.2 and not with that of *destai*. The only meristic difference between the two species is the number of pored scales in the anterior lateral-line series (Table 5). However, Clark does not describe the scalation of either her n.sp.2 or *destai*. The abdomen of *clarkae* is entirely covered with ctenoid scales and there is a single row of cycloid scales on the pectoral fin base. Both these features are absent in *destai* (Springer, pers. comm.). The two species also differ in colour pattern. The body bars of *clarkae* and Clark's n.sp.2 are vertical and very distinct, whereas those of *destai*, except the bar on the caudal peduncle, are faint and oblique. The peduncular bar of *destai* is dark and constricted in the centre giving the impression of an hour-glass. Another species with a very distinctive hour-glass-like peduncular is *E. elegans* (Peters, 1876). However, *elegans* has a scaled abdomen, 17 anal fin rays and 17+17 lateral line scales. Finally, this series of *clarkae* includes specimens smaller than the largest specimens of *destai*. The two species are thus clearly distinct.

Etymology

Eugenie Clark was aware of the South African specimens of her *Enneapterygius* n.sp.2 prior to publication of the Red Sea revision. She, however, very kindly consented that I name and describe the species. Eugenie Clark also provided me with a draft manuscript of her Red Sea revision in 1976. This was of invaluable assistance in a revision of the South African tripterygiids which formed the basis of my Masters dissertation. It is thus fitting—and it gives me great pleasure—to name the species for her.

Distribution

The distribution of *E. clarkae* is shown in Fig. 3.

Enneapterygius ventermaculus **sp.nov.** Fig. 7

Diagnosis

Third dorsal fin usually with 10 rays; anal fin usually with 19 rays. Supratemporal sensory canal "U"-shaped. Row of 5–6 conspicuous black spots at base of anal fin and one anterior to vent.

Description

(Characters in diagnosis not repeated; characters for holotype in parenthesis).

Dorsal fins III+XI–XIII+9 –10 (III+XII+9), usually III+XII+10; first dorsal fin height equal to second dorsal fin in females, slightly higher than second in males; anal fin I+17–20 (I+18), usually 19 rays; pectoral fin rays 14, upper 1–3 undivided, lower 7 thickened and undivided, remainder bifurcate; caudal fin 7–8 7+6, 6–7 pelvic fin rays united by membrane for about half their length. Lateral-line anterior series 13–16 (13), usually 15 pored scales ending under last third of second dorsal fin; posterior series 21–25 (22), usually 23 notched scales from two scale rows below end of anterior series, overlapping by 1–3 scales and continuing to base of caudal fin; transverse scales 2/6; lateral scales 32–34, usually 33. Precaudal vertebrae 10, caudal 24–26. Head 3,4–4,0 in SL; eye 3,0–3,7, upper jaw 2,8–3,3, snout 3,0–3,4 in head; snout angle 76°–78°. Head and pectoral fin bases naked; body except abdomen from line between upper angle of pectoral fin base to origin of anal fin with ctenoid scales. Free pterygiophore between second and third dorsal fin cartilagenous; hypural 5 absent.

Colour (in preservative)

No live or freshly dead specimens have been seen. The body is irregularly pigmented with dark brown to black melanophores, the pigment normally occurring on the posterior margins of the scales. There is a row of irregular blotches along the lateral midline, the darkest forming a bar at the base of the caudal fin. This bar may be divided ventrally to form an inverted "Y". The head is lightly spotted with small clusters of melanophores on the cheeks. The lower half of the pectoral fin bases have clusters of melanophores forming narrow bars. There is a dark blotch on either side of the midline on the throat and near the base of the brachiostegals. The abdomen is unpigmented except for a conspicuous black mark, frequently triangular in shape with apex anterior, which lies just anterior to the anus (Fig. 7b). This mark may also be roundish or crescentic. The caudal and pectoral fins each have 4–5 irregular, faint dusky bars, with the pigmentation on the rays only, giving the fins a spotted appearance. There are 5–6 irregularly spaced dark spots at the anal fin base. These are continued as "bars" across the fin. Pigmentation occurs only on the rays so that when the fin is extended these spots form a dotted line running obliquely forward from the basal spot. The first dorsal fin is irregularly dusky whereas the second may have four broad, irregular bars, and the third three broad irregular bars. There is considerable variation in the intensity of pigmentation in different individuals. However, all specimens have a spotted appearance with the distinct preanal mark. No sexual dichromatism is evident.

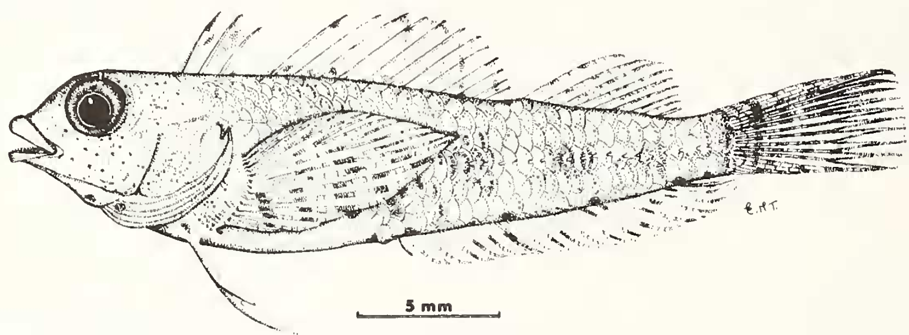

FIG. 7. *Enneapterygius ventermaculus* sp.n., RUSI 7943, Holotype, female, 24,8 mm SL.

Material examined

Holotype—RUSI 7943, female (24,8 mm SL); rock pool about 10 km south of Sodwana Bay (27° 37′ 30″, 33° 40′ 50″E), Zululand, South Africa; depth 0–3 m; July, 1976; R. Winterbottom *et al.*; field number RW–76–8.

Paratypes—RUSI 7947 (1, 24,7 mm SL); from same collection as holotype.

RUSI 7944 (4, 17,8 & 25,7 mm SL); rock pool at six mile reef, Zululand; depth 0–2 m; July 1976; R. Winterbottom *et al.*; field number RW–76–9.

RUSI 7945 (1, 23,5 mm SL); reef with corals about ½ km offshore Sodwana Bay, Zululand; depth 8 m; June, 1877; M. S. Christensen *et al.*; field number MSC–77–18.

RUSI 7946 (1, 27,1 mm SL); reef with corals and sponges about ¾ km offshore Sodwana Bay, Zululand; depth 11–13 m; June, 1977; M. S. Christensen *et al.*; field number MSC–77–17.

LACM 38309–5 (6, 25,6–27,7 mm SL); tide pool with rock and algae, Beluji Point, Sind, Pakistan; depth 20–60 cm; 27 January, 1979; C. C. Swift *et al.*; field number CCS 79–20.

LACM 38310–10 (43, 20,2–31,8 mm SL); tide pool with sand, rocky rubble and algae. Beluji Point, Sind, Pakistan; depth 20–60 cm; 27 January, 1979; C. C. Swift *et al.*; field number CCS 79–21.

LACM 38320–9 (2, 27,2 & 31,8 mm SL); small cove with boulders and algae, 4,8 km west of nuclear power plant, Karachi, Pakistan; depth 0–5 m; 13 February, 1979; C. C. Swift *et al.*; field number CCS 79–34.

BMNH 1954.4.26.209–214 (6, 19,5–21,9 mm SL); rock pools, Aden; 1954; A. Fraser-Brunner.

BMNH 1954.4.26.191–196 (6, 17,2–23,6 mm SL); rock pools, Mukalla, Aden; 1954; A. Fraser-Brunner.

BMNH 1954.4.26.197–208 (12, 17,0–24,0 mm SL); tide pools, Alayu, Aden; 1954; A. Fraser-Brunner.

Etymology

The name is a combination of the Latin *venter*, meaning "belly" and *maculus*, a spot or a mark, and is given for the distinct black preanal mark. It is to be treated as a noun in apposition.

Distribution

On the east coast of Africa this species has only been taken in Zululand but may also occur further north. The species appears to be fairly common in Pakistan and there are a few specimens known from Aden.

Comparisons

The only species which approaches *E. ventermaculus* in overall appearance is *E. clarkae*. In the latter species the bars on the body are much more distinct; it has fewer scales in the anterior lateral line series (11–12 vs. 13–16), fewer anal fin rays (16–17 vs. 18–19), a crescent-shaped supraoccipital sensory canal, and a scaled abdomen and pectoral fin base. The salient features of six Indian Ocean species of *Enneapterygius* are compared in Table 5.

Genus Cremnochorites **gen. nov.**

Type-species *Tripterygium capense* Gilchrist & Thompson, 1908

Diagnosis

First dorsal fin with four spines; anal fin with two spines. Lateral line divided. Body heavily scaled with ctenoid scales; head with denticle like scales; row of "ctenii" around perimeter of eye. Orbital tentacle large and multifid, nasal tentacle similar but smaller. Single row of conical teeth on vomer and palatines.

Description

Dorsal fins IV+XIV–XV+10–11; some rays may be bifurcate and the last is usually divided to its base; first dorsal fin lower than second. Anal fin II+21–22, the last ray usually divided to its base. Pectoral fins with 16 rays, upper 8 bifurcate, lower 8 simple and thickened.

TABLE 5

Comparison of selected characters of five species of *Enneapterygius*

	E. ventermaculus (58 specimens)	*E. destai* (Red Sea-87 specimens)	*E. n. sp. 1* (Red Sea-5 specimens)	*E. clarkae* (11 specimens)	*E. elegans* (30 specimens)
Second dorsal fin spines	11–13	11–13	12–14	11–12	11–13
(Usual number)	(12)	(12)	(12)	(12)	(12)
Third dorsal fin rays	9–10	8–9	8–9	8–10	8–10
(Usual number)	(10)	(9)	(9)	(9)	(9)
Pectoral fin rays	14	14–15	14–15	14–15	16
Anal fin rays	18–19	15–17	15–17	16–17	16–17
(Usual number)	(19)	(16)		(16)	(17)
Lateral line:					
Anterior series	13–16	8–12	12–13	11–12	16–18
(Usual number)	(15)	(10–11)		(12)	(17)
Posterior series	21–25	19–23	22	20–22	16–18
(Usual number)	(22)	(21–22)		(22)	(17)
Vertebrae: precaudal	10	10–11		10	10
(Usual number)	25–26	20–22		22–23	23
Caudal (Usual number)	(26)	(21)		(23)	
Scalation: abdomen	naked	naked	?	scaled	scaled
Pectoral fin base	naked	naked	?	single row scales	naked
Supratemporal sensory canal	"U"	crescent	crescent	crescent	crescent
Colour in preservative	spotted with distinct preanal mark.	Faint oblique bars, prominent hourglass-like peduncular mark; preanal mark.	conspicuous vertical bars, distinct preanal mark.	conspicuous vertical bars, distinct preanal mark.	Irregular faint bars; prominent hourglass-like peduncular mark; no preanal mark.

The data for Red Sea species were taken from Clark (1979). Vertebral counts of Red Sea specimens are not comparable with counts given for South African specimens. (See methods).

Caudal fin 6 dorsal, 5 ventral procurrent rays. Lateral-line anterior series of 21–24 pored scales running to below anterior of third dorsal fin; posterior series of 17–20 notched scales extending from below end of anterior series onto caudal peduncle. Body heavily scaled, all scales with relatively large, irregular cteni (Fig. 8 A–D); scales on abdomen with few cteni. A few cycloid scales occur around vent and at base of pelvic fins. Scale rows somewhat irregular. Head and pectoral fin bases covered with ctenoid scales; those on posterior edge of opercle about half size of body scales, decreasing in size anteriorly to small denticle-like scales with few, large cteni below eye and on cheeks (Fig. 9A). Scales on head and particularly on cheeks appear to be situated on small pedestals, creating appearance of shark denticles. Small denticle-like spines on nape and interorbital area, apparently ankylosed to cranial bones. Perimeter of eye with ring of "cteni" (Fig. 9B); similar "cteni" on posterior end of maxilla. Skin of isthmus papillose with single "cteni" or spines embedded in papillae (Fig. 9C).

Posterodorsal margin of post-temporal serrated; interorbital concave, with ridge over each orbit; transverse depression behind orbits. Head broad with rounded profile. Large multifid orbital tentacle present; similar, small tentacles on posterior margin of anterior nostrils. Mandibular sensory canals confluent, opening as single pore posterior to lower jaw symphysis. Both jaws with slightly recurved conical teeth, a patch in front grading to a single row at back of jaw. Teeth unequal in size on lower jaw; upper jaw with outer row of large teeth and inner band of small teeth. Vomer with single row of slightly recurved conical teeth which continues into palatines. Septal bone present; cephalic lateralis canals covered by bone. Caudal skeleton with large hypural 5 and two free epurals.

DISCUSSION

Cremnochorites capense was originally placed in *Tripterygium (=Tripterygion)* by Gilchrist & Thompson (1908). It was later transferred to *Gillias* Evermann & Marsh, 1899 by Barnard (1927) and retained there by Smith (1949). Rosenblatt (1960) placed *Gillias* in synonymy with *Enneanectes* Jordan & Evermann, 1895 (a genus restricted to the eastern tropical Pacific and the western tropical Atlantic). Rosenblatt (1960: 3) did not refer Indo-Pacific species in *Gillias* to any other genus but merely stated that "none of the Australian or South African species referred to *Gillias* has anything to do with that genus". Clark (1979) suggested that *G. capense* be referred to *Norfolkia* Fowler, 1953 for these taxa share four first dorsal fin spines, two anal fin spines and a scaled head. However, *Cremnochorites* differs from *Norfolkia* in a number of characters: palatine teeth are present in *Cremnochorites* and absent in *Norfolkia*; lateral-line counts are reversed, 21–22 pored, 15–16 notched scales for the former compared with 13–17 pored, 21–23 notched scales for *Norfolkia*. The head scales of *Cremnochorites* are quite unlike those of any other tripterygiid examined (see Description).

Body scales of the species in the two genera are also very different. Those of *Cremnochorites* (Fig. 8) are heavily ctenoid and the cteni are generally unequal in size. Pored lateral-line scales frequently have 2–3 rows of cteni in the centre of the row. Scale foci are close to the posterior edge of the scale and the radii are thus comparatively long. (Radii occur only in the anterior field). In *Norfolkia* (Fig. 10) cteni are smaller, more or less equal in size and always in a single row. Scale foci are further away from the posterior margin of the scale and the radii are consequently relatively shorter.

Cremnochorites also possesses a septal bone (*sensu* Springer & Freihofer, 1976; Fig. 16) which is absent in *Norfolkia*. Furthermore, the sensory canals in the infraorbitals and nasals of *Cremnochorites* are complete, as are those portions of the preopercle, posttemporal and pterotic which carry sensory canals. In *Norfolkia* these canals are open laterally, except the nasals which may be narrowly bridged.

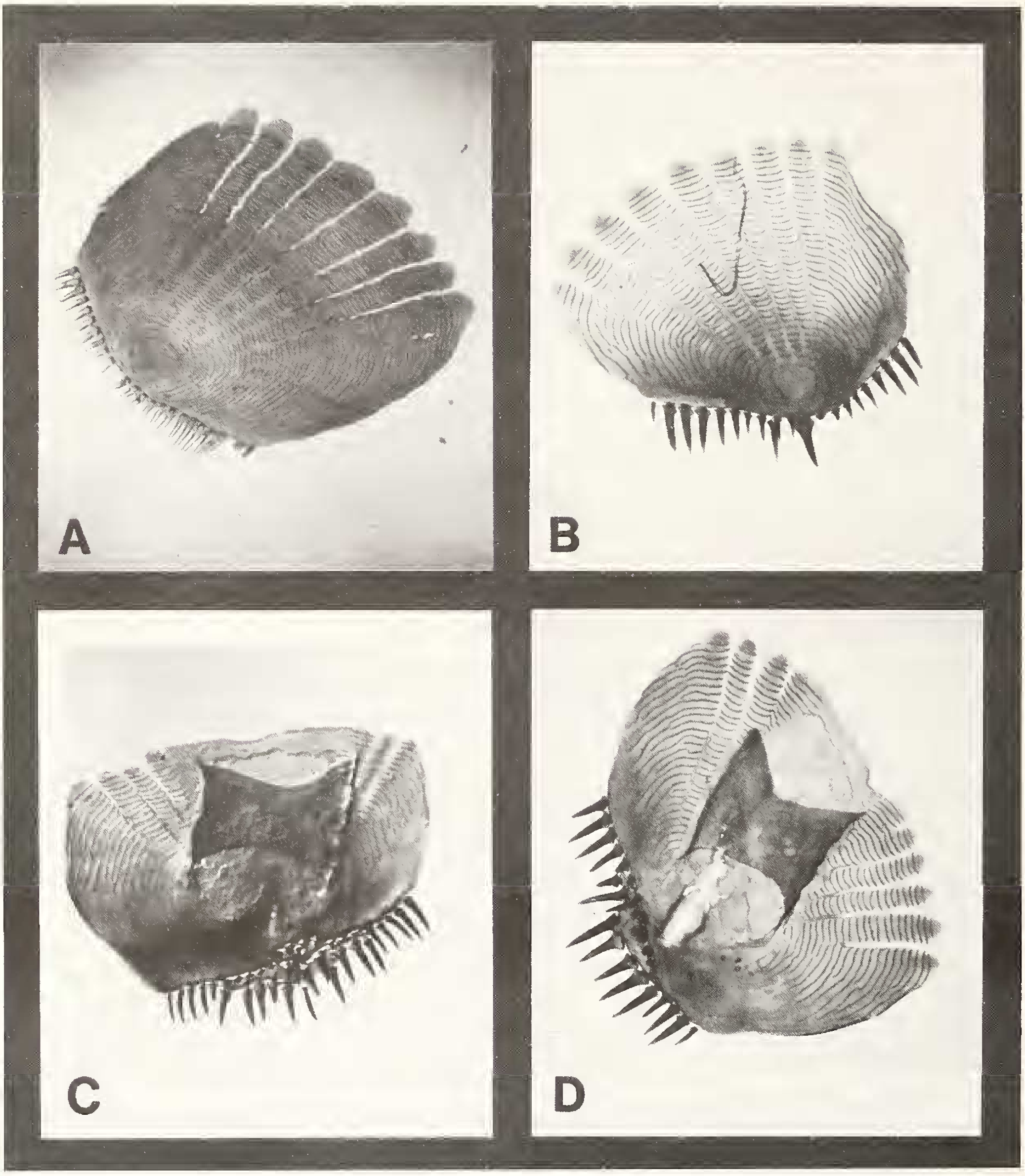

FIG. 8. Examples of body scales (A, B) and pored lateral-line scales (C, D) of *Cremnochorites capensis*.

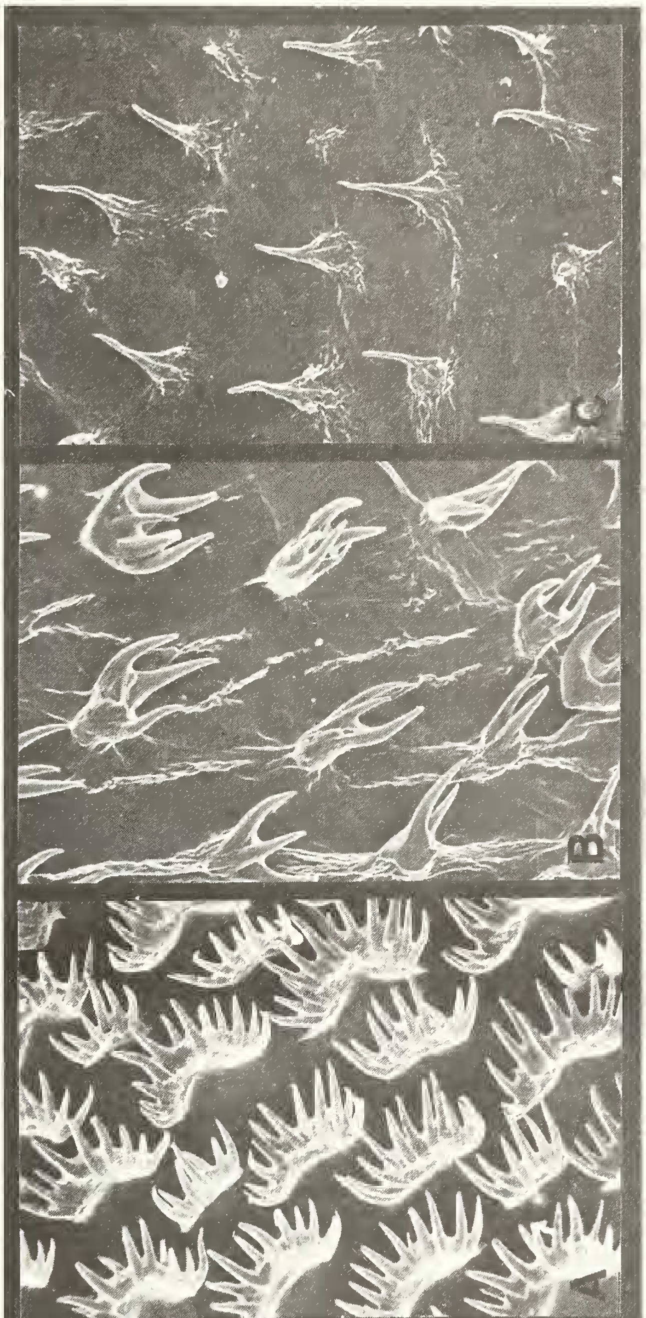

FIG. 9. Stereoscan photographs of the head scales of *Cremnochorites capense*. All examples from a 70 mm SL specimen. (A) Cheek scales (40×). (B) Portion of skin from perimeter of eye (80×). (C) Portion of skin from throat (papillae shrivel with vacuum coating) (80×).

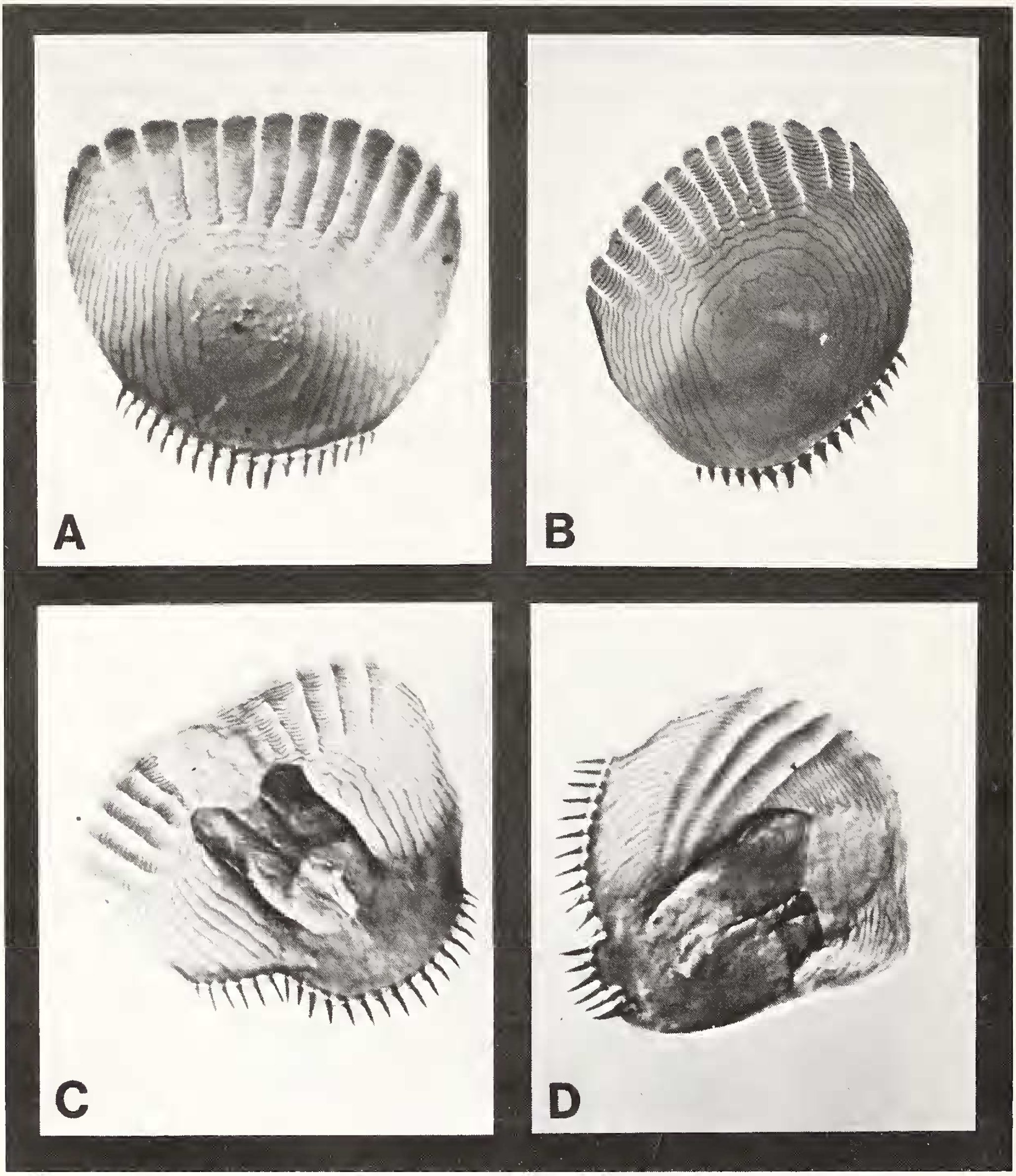

Fig. 10. Examples of body scales (A, B) and pored lateral line scales (C, D) of *Norfolkia springeri*.

Specimens of all nominal species of *Norfolkia* have been seen. The species appear to form a coherent group with little interspecific variation. There are no species which share the curious head scalation with *Cremnochorites* or have palatine teeth. The loss of palatine teeth and the possible secondary loss of the septal bone in *Norfolkia* may represent synapomorphies for the genus. However, pending revision of *Norfolkia* and an assessment of the septal in Tripterygiidae, no further comments can be made about *Norfolkia*.

The species *capensis* can patently not be referred to *Norfolkia*. The septal and highly derived head scalation is considered sufficient to warrant the placing of this species in a new genus.

Cremnochorites capense is the only species thus far examined which can be ascribed to this genus. It has been taken in False Bay, western Cape, at Skoenmakerskop (near Port Elizabeth) and at Port Alfred (gully at 15 m), eastern Cape, South Africa. Specimens have also been taken at the Storms River mouth and in the mouth of the Knysna estuary. The four type specimens were taken in shrimp trawls, two at 5 fms (10 m) and two at 14 fms (28 m). The other specimens were taken at 1–20 m depth. With the exception of the types, for which there are no other collection data, all other specimens were taken from relatively sheltered, vertical, seaweed and *Pyura* covered rock faces.

Etymology

Cremnochorites is derived from the Greek *kremnos*, a cliff, and *chorites*, native or country man. It is thus named because it has only been found associated with vertical rock faces. The gender is masculine.

Cremnochorites capense (Gilchrist & Thompson) **comb. nov**. Fig. 11

Tripterygium capense Gilchrist & Thompson, 1908: 140 (Type locality False Bay, Cape, South Africa); Thompson, 1918: 151; *Gillias capensis* Barnard, 1927: 827; Smith, 1949: 359.

Diagnosis

As for the genus.

Description

Dorsal fins IV+XIV–XV+10–11, usually IV+XIV+11, first dorsal fin lower than second, rays except first branched once; anal fin II+21–22, usually 21 rays; pectoral fin rays 16, lower 8 thickened and undivided, uppermost sometimes undivided, remainder divided once; caudal fin 6,6+7,5. Lateral-line anterior series 21–24 pored scales to end of second or beginning at third dorsal fin, posterior series 17–20, usually 19, notched scales from two scales below anterior series and frequently overlapping by 4 or more scales, to base of caudal fin; transverse scales 5/11; longitudinal scales 36–37. Precaudal vertebrae 10, caudal 27–28. Head, 3,3–3,7 in SL; eye 3,0–3,6, upper jaw 2,0–2,4, snout 3,6–4,4 in head. Snout angle 71°–76°. Balance of description is as given for the genus. The only sexual dimorphism noted consists of a single, conical papilla at the posterior of the vent in males and a "rosette" around the vent of females. This "rosette" may or may not protrude a short distance. Although these features appear to be common to many tripterygiids, they cannot always be distinguished.

Colour

In preservative, these fishes are generally grey with a pale belly. There are six, irregular, vertical dark bars on the body above the lateral midline. These may divide into eight or more bars below the midline. The lower body bars may alternate with the upper bars. In juveniles the bars are continuous across the body and are more distinct. The penultimate bar is across the peduncle and the last bar lies at the base of the caudal fin. A dark bar extends across the nape and continues on to the opercles. Another bar runs from below the midline of the eye to the corner of the mouth. There is an irregular dark blotch on the lower portion of the opercle. The orbital tentacles are dusky. The anal and caudal fins have irregular small dark blotches. The first dorsal fin is dark whereas the second and third have dusky margins. Neither the pelvic nor pectoral fins are pigmented although there are two short dark bars on each pectoral fin base. Males have dusky brachiostegal membranes and a more darkly pigmented head than females. Freshly caught fishes are rust-coloured and the irregular blotching renders them cryptic in brown and purple algae. One live specimen was seen in the mouth of the Knysna estuary. It may have been a male in breeding dress as it had a bright yellow head and first dorsal fin.

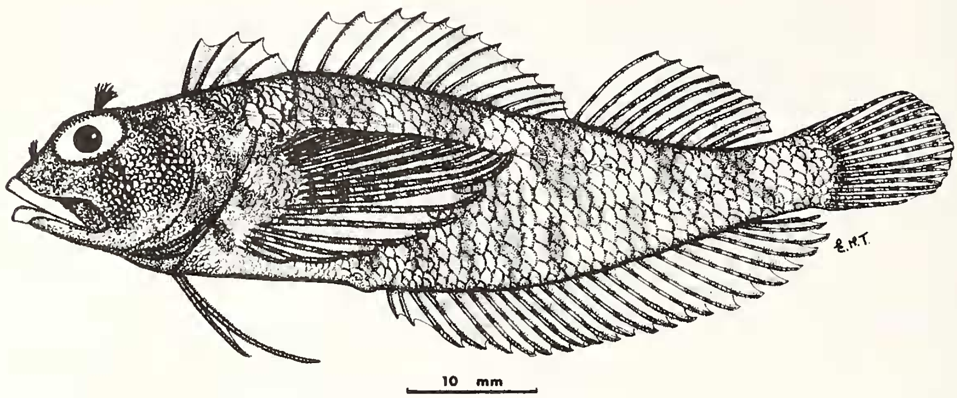

FIG. 11. *Cremnochorites capense*. RUSI 75–21. male, 80 mm SL.

material examined

3 Syntypes, SAM 9900, females (46–53 mm SL), 10–28 m depth, False Bay, Cape, South Africa, collected in a shrimp trawl; *1 Syntype,* SAM 9901, male (54,7 mm SL), collected with SAM 9900.

RUSI 7384 (49,3 mm SL), False Bay, Cape, South Africa, no date.

RUSI 75–22 (8, 46,9–61 mm SL), cliff with *Pyura* sp., False Bay, Cape, South Africa; depth 6–8 m; 1 November, 1975; R. Winterbottom *et al.;* field number RW–75–22.

RUSI 75–21 (1, 80 mm SL), sheltered bay with vertical rock walls; Platboom, Cape, South Africa; depth 2–3 m; 1 November, 1975; R. Winterbottom *et al.;* field number RW–75–20.

RUSI 76–7 (12, 26,9–55,6 mm SL) from vertical rock wall with algae; Skoenmakerskop, Eastern Cape, South Africa; depth 4 m; 19 January, 1976; R. Winterbottom *et al.;* field number RW 76–1.

RUSI 77–7 (2, 18,5 & 41,7 mm SL) same site as above; depth 5 m; 1 February, 1977; M. Christensen *et al.;* field number MSC 77–4.

GENERAL DISCUSSION

Only one major revision of the family Tripterygiidae has ever been undertaken; that by Rosenblatt (1959) as a Ph.D. dissertation. To date the major portion of this revision is unpublished.

The concepts of systematics have undergone radical changes in the past 20 years. With the introduction of the Hennigian approach to systematics it has become accepted to consider as valid only those taxa that comprise entities that share one or more derived characters—synapomorphies. Only by identifying synapomorphic characters can taxa be properly defined and the interrelationships of taxa assessed. No such study has been undertaken for the Tripterygiidae and as such the family, as well as the genera within it, remain undefined.

Springer (pers. comm.) informs me that the one osteological character that serves to define the family and delimit it from all other blennioid fishes is the derived loss of at least the posteriormost spine of the second dorsal fin (Fig. 12C). All other blennioids have a spine immediately anterior to the first ray (Fig. 12A) although it may be greatly reduced, as in *Entomacrodus nigricans* Gill (Fig. 12B). In many tripterygiid genera the first ray of the third dorsal fin is also lost, leaving a free pterygiophore which supports nothing in the "gap" between the second and third dorsal fins (Fig. 12D). This pterygiophore frequently becomes considerably reduced (Fig. 12E) and in some specimens of *E. pusillus* and *E. ventermaculus* a spine and two rays have been lost, and the free pterygiophores are unossified (Fig. 12F). It is as yet not known how consistent the degree of loss is within a genus. The minimal loss of the posteriormost spine is found in representatives of 12 genera inspected and is synapomorphous for the family.

The species *E. pusillus* and *E. ventermaculus* which have at least one unossified pterygiophore also have a "U"-shaped supratemporal sensory canal (Fig. 13A) whereas the species of *Enneapterygius* which have an ossified free pterygiophore *(E. abeli, E. clarkae, E. elegans)* have a crescentic supratemporal sensory canal (Fig. 13B). Furthermore, in those species which possess a "U"-shaped supratemporal sensory canal, it would appear that the extreme curvature of the canal around the first dorsal fin has been brought about by the forward movement of the dorsal fins. This has resulted in a compression of the pterygiophores of the first dorsal fin as they have moved forward over the back of the neurocranium (Fig. 14) and a concomittant depression of the supraoccipital giving rise to a concave supraoccipital bone.

If these two states (the non-ossification of the free pterygiophore plus "U"-shaped supraoccipital sensory canal and associated features as opposed to an ossified free pterygiophore plus crescentic supratemporal sensory canal) are found to be consistent for all species ascribed to *Enneapterygius* there may be sufficient reason to divide the genus into two separate taxa.

Springer & Freihofer (1976) described a *de novo* autogenous ossification in the interorbital septum of *Pholidichthys leucotaenia* and named the bone the septal. Ruck (1977) found the same bone in the tripterygiid *Forsterygion varium;* Springer (pers. comm.) found it present in *Gilloblennius,* another tripterygiid, and Holleman (1978) found a septal in species of a number of other tripterygiid genera viz. *Cremnochorites, Enneapterygius,* (Fig. 15) *Helcogramma, Notoclinops, Tripterygion* and *Vauclusella.* It is absent in *Brachynectes, Lepidoblennius, Norfolkia* and *Notoclinus.* Whether the septal was originally developed in those last four genera and secondarily lost, or not developed at all has still to be determined.

The presence of a septal in certain tripterygiid genera suggests some relationship between the Tripterygiidae and Pholidichthyidae. Freihofer (pers. comm.) informs me that there are considerable similarities between the trunk lateral line nerve patterns of *Pholidichthys* and *Forsterygion* which is again suggestive of relationship between the two families. Springer & Freihofer (1976) only considered *Pholidichthys* to show possible relationship with the tropical blennioid fishes (superfamily Blennioidea) considered by George & Springer (1980) to include the Clinidae, Blenniidae, Dactyloscopidae, Tripterygiidae, Labrisomidae and Chaenopsidae.

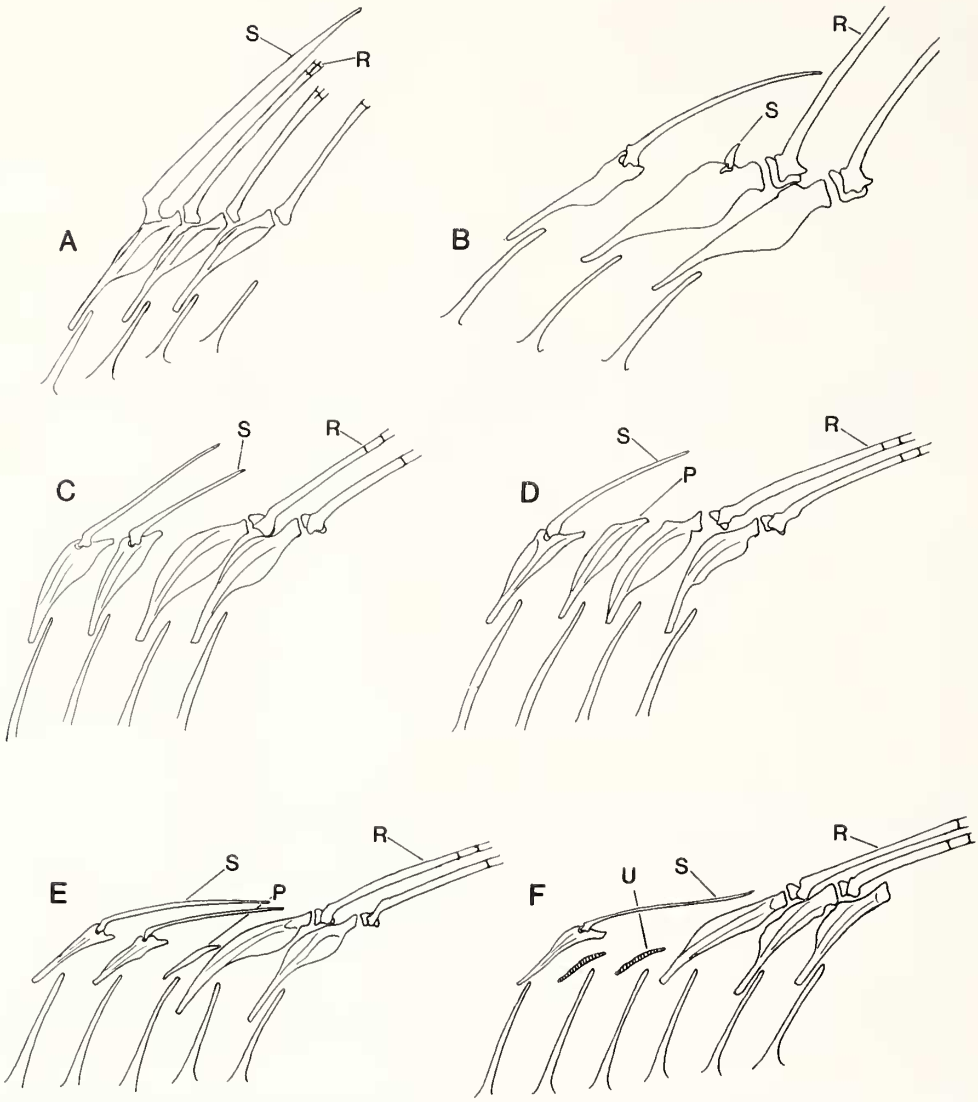

FIG. 12. Junction of spinous and rayed dorsal fins of: A—*Pavoclinus laurentii* (Clinidae); B—*Entomacrodus nigricans* (Blenniidae); C—*Norfolkia squamiceps* (Tripterygiidae), D—*Cremnochorites capensis* (Tripterygiidae); E—*Enneapterygius elegans* (Tripterygiidae), and F—*Enneapterygius pusillus*. S—last spine, R—first ray, P—free pterygiophore, U—unossified free pterygiophore. (B—portion of Figure 10, Springer 1968).

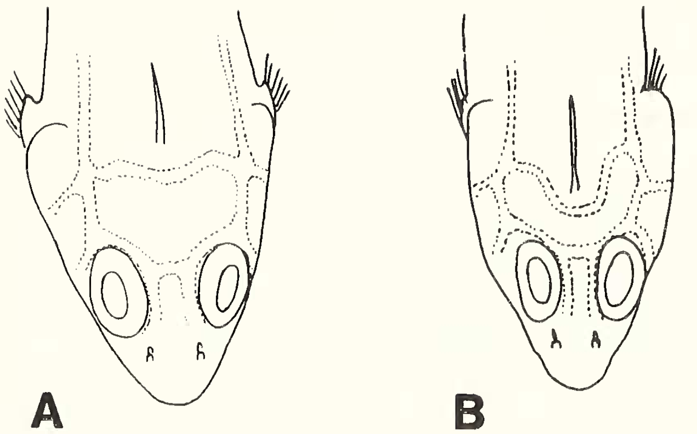

FIG. 13. Diagram of crescentic (A) and "U"-shaped (B) supratemporal sensory canals in *Enneapterygius* spp.

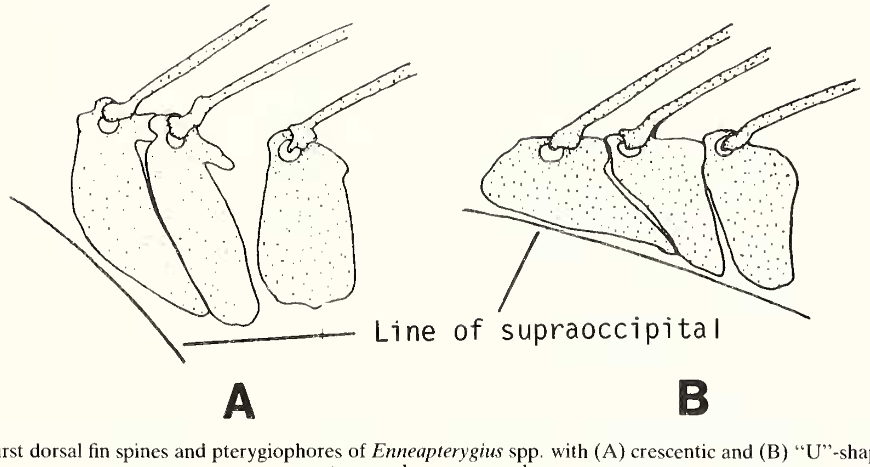

FIG. 14. First dorsal fin spines and pterygiophores of *Enneapterygius* spp. with (A) crescentic and (B) "U"-shaped supratemporal sensory canals.

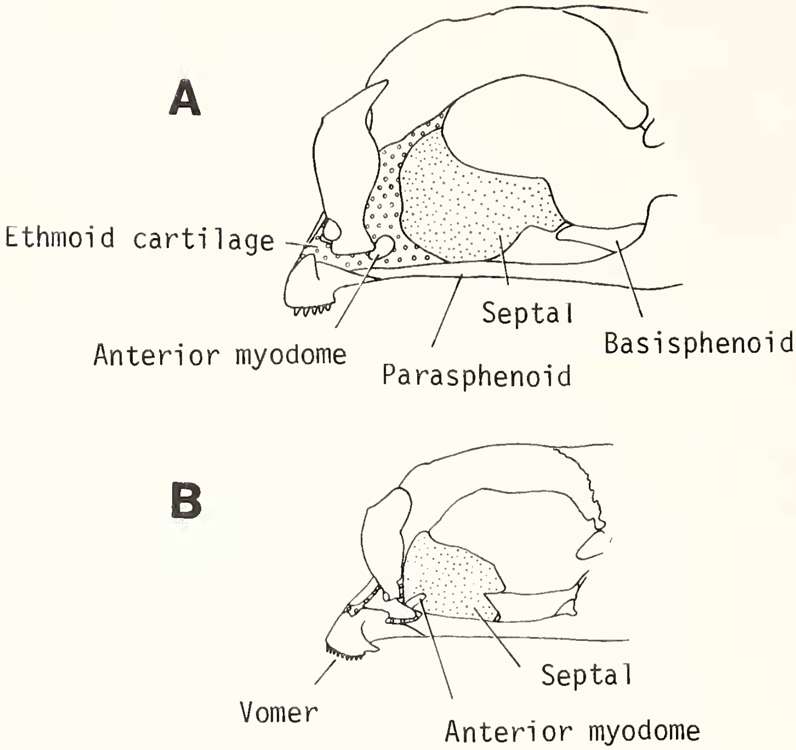

FIG. 15. Septal of (A) *Cremnochorites capensis* and (B) *Enneapterygius clarkae*.

ACKNOWLEDGEMENTS

The author is indebted to a number of people and institutions which provided specimens on loan or as gifts: G. R. Allen, Western Australian Museum; D. F. Hoese, Australian National Museum; W. Klausewitz, Senckenberg Museum; V. G. Springer, National Museum of Natural History; C. C. Swift, Los Angeles County Museum of Natural History; R. Winterbottom, Royal Ontario Museum; the British Museum (Natural History); the Hebrew University of Jerusalem, and the South African Museum.

The illustrations of the species were executed by Mrs E. M. de Villiers (E. M. Tarr) and R. E. Stobbs made the radiographs used in this study. The electron micrographs were produced by the Electron Microscope Unit of Rhodes University.

Portion of this study received financial support from Prof. M. M. Smith, the Research Committee of Rhodes University and the University Research Division of the Council for Scientific and Industrial Research.

Drafts of this manuscript were reviewed by Dr P. C. Heemstra, Dr V. G. Springer and Dr R. Winterbottom.

LITERATURE CITED

Barnard, K. H. 1927. A monograph of the Marine Fishes of South Africa. *Ann. S. Afr. Mus.* **21** (2): 419–1065.

Bleeker, P. 1858. Vierde bijdrage tot de kennis der vischfauna van Biliton. *Natuurk. Tijdschr. Ned.-Indië.* **15:** 219–240.

Clark, E. 1979. Red Sea Fishes of the Family Tripterygiidae with Descriptions of Eight New Species. *Israel J. Zool.* **28:** 65-113.

Clark, E., A. Ben-Tuvia and H. Steinitz 1968. Observations on a Coastal Fish Community, Dahlak Archipelago, Red Sea. *Bull. Sea Fish. Res. Stn Israel* **49:** 15–31.

Evermann, B. W. and M. C. Marsh 1899. Investigations of the Aquatic Resources and Fisheries of Porto Rico. *Bull. U.S. Fish Comm*: 1–330.

Day, F. 1876. *The Fishes of India.* London.

de Beaufort, L. F. and W. M. Chapman 1951. *The Fishes of the Indo-Australian Archepelago. IX. Percomorphi (concluded), Blennioidea.* Leyden: E. J. Brill.

Fowler, H. W. 1946. Collection of Fishes Obtained in Riu Kiu Islands by Captain Ernest R. Tinkham A.U.S. *Proc. Acad. nat. Sci. Philad.* **98:** 184–193.

Gilchrist, J. D. F. and W. W. Thompson 1908. The Blenniidae of South Africa. *Ann. S. Afr. Mus.* **6** (2): 1–212.

Gosline, W. A. 1968. The Suborders of the Perciform Fishes. *Proc. U.S. natn. Mus.* **124** (3647): 1–78.

Herre, A. C. W. T. 1944. Notes on Fishes in the Zoological Museum of Stanford University. XVII New Fishes from Johore and India. *Proc. biol. Soc. Wash.* **57:** 45–52.

Holleman, W. 1978. *The Taxonomy and Osteology of Fishes of the Family Tripterygiidae (Perciformes: Blennioidei) of South Africa.* Unpublished M.Sc. Dissertation, Rhodes University, Grahamstown.

Hubbs, C. L. and K. F. Lagler 1958. Fishes of the Great Lakes Region. *Cranford Inst. Sci. Bull.* **26:** 1–213.

Klunzinger, C. B. 1871. Synopsis der Fische des Rothen Meeres. *Verh. zoolbot. Ges. Wien* **21:** 441-688.

Lal Mohan, R. S. 1971. *Helcogramma shinglensis*, a new species of tripterygiid from the Gulf of Mannar, with a key to the fishes of the family Tripterygiidae of the Eastern and Central Indian Ocean. *Senckenberg. Biol.* **52** (3/5): 219–223.

McCulloch, A. R. and E. R. Waite 1918. Some New and Little-known Fishes from South Australia. *Rec. S. Aust. Mus.* **1:** 51–53.

Rosenblatt, R. H. 1959. *A Revisionary Study of the Blennioid Fish Family Tripterygiidae.* Unpublished Doctoral Dissertation, University of California, Los Angeles.

Rosenblatt, R. H. 1960. The Atlantic Species of the Blennioid Fish Genus *Enneanectes. Proc. Acad. nat. Sci. Philad.* **112:** 1–23.

Ruck, J. 1976. *Studies on the development and osteology of some New Zealand inshore fishes.* Unpublished Doctoral Dissertation, Victoria University of Wellington, N.Z.

Rüppell, E. 1835. *Neu Wirbelthiere zu der Fauna von Abyssinien gehörig, Fische des rothen Meeres.* Frankfurt: Bronner.

Smith, J. L. B. 1949. *The Sea Fishes of Southern Africa.* Fifth Edition 1965, Johannesburg: Central News Agency.

Springer, V. G. 1968. Osteology and Classification of the Fishes of the Family Blenniidae. *Bull. U.S. natn. Mus.* **284:** 1–80.

Springer, V. G. and W. C. Freihofer 1976. Study of the Monotypic Fish Family Pholidichthyidae (Perciformes). *Smithson. Contr. Zool.* **216:** 1–43.

Talwar, P. K. and T. K. Sen 1971. On some fishes from the Madras Coast with a description of a new species of the family Clinidae. *Rec. Zool. Surv. India* **65** (1–4): 243–251.

Taylor, R. W. 1967. Outline of a Method of Clearing Tissues with Pancreatic Enzymes and Staining Bones of Small Vertebrates. *Turtox News* **45** (12): 308–309.

Zander, C. D. and A. Heymer 1970 *Tripterygion tripteronotus* (Risso, 1810) und *Tripterygion xanthosoma* n.sp: eine ökologische speziation. (Pisces, Teleostei). *Vie Milieu* **21** (24): 364–395.